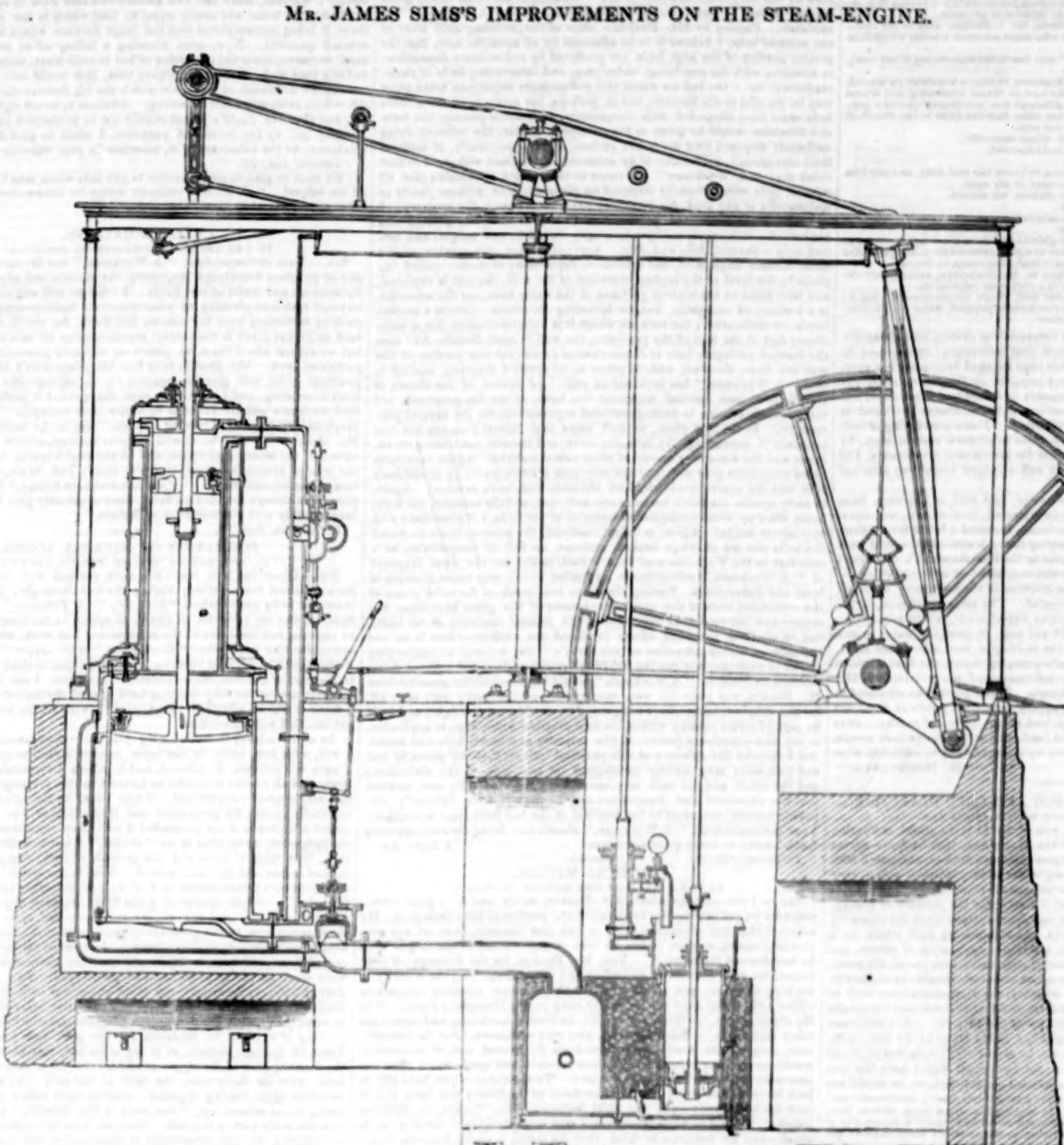
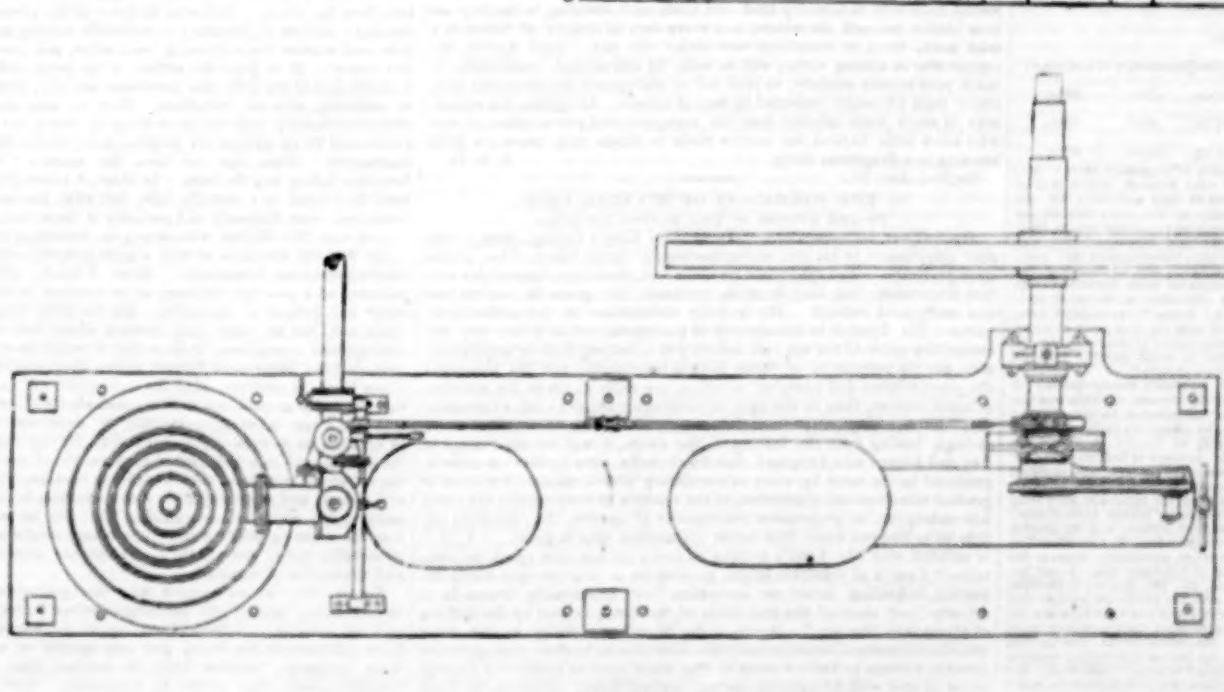
The Mining Journal.

No. 388.] SUPPLEMENT. [Jan. 28.

Mr. James Sims's Improvements on the Steam-Engine.





Scale of Feet

[Mr. Sims's communication, explanatory of the above diagram, for convenience of reference, is inserted on page 26.]

ORIGINAL CORRESPONDENCE.

THE DISCUSSION ON THE WATER-WHEEL QUESTION.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Referring to the Index of the Twelfth Volume of your valuable Journal, reminded me of a subject, in which I have taken particular interest throughout the year 1842—viz.:

WATER-WHEELS, pp. 86, 102, 120, 159, 161, 156, 164, 166, 171, 187, 197, 205, 206, 218, 225, 269, 300, 304, 331, 411, 413; on the power and construction of, 37, 47, 51, 69, 85; propelled by wind, 65; improvements in breast and pitch back, 121; economical application of steam-power to, 244.

First, page 86—"P. V. W." says, 164 per cent.

102—Two acrimonious letters from a Bickleigh Miner, dwelling on cranks, with abstruse calculations.

120—R. Deuterand condemns the Bickleigh Miner's calculations, and says, "I conceive he is endeavouring to establish an error."

156—W. Wheeler says, from as 1 is to 4, to as 1 is to 8.

161—A Bickleigh Miner finds fault with Mr. Wheeler's letter.

164—W. Wheeler shows plainly that Bickleigh wheel cannot possibly perform 80 per cent.

164—O. Harkless says the same.

166—A Bickleigh Miner's calculations.

171—M. D. Thomas says, that the possible actual power could not exceed 50 p. ct.

171—"H. M." says, naturally impossible to perform 80 per cent.

187—Bickleigh Miner writes, saying his friend, Mr. J. Phillips, says 75 per cent., and that a "fool's cap" was due to the man who could not erect a better wheel than his father.

197—O. Harkless says, that a "fool's cap" was due to the man saying 80 per cent., or as 2 is to 5.

204—A Denbigh Miner positively denies Professor Phillips's assertion on wheels, which appeared on folio 279, saying, that the best of Wheal Friendship and Wheal Betsy wheels never performed 40 per cent., although that gentleman quoted a publication in which it was stated 72; and further adds, that the table in the *Practical Miners' Guide* may be depended upon—28¼ per cent.

200—"H. M." confirms what the Denbigh Miner says—28¼.

218—R. Edwards's calculations abstruse and imperfect.

225—W. Wheeler says, 28¼ per cent.

269—H. Penberthy offers to meet any person to prove the real duty, and pay him 1l. 1s. per day and his expenses, should it exceed 50 per cent.

325—John Budge says, R. Edwards's calculations are absurd.

325—O. Harkless says, nearly 25 per cent.

331—A repetition of R. Edwards's absurd calculations.

304—O. Harkless, Dublin, asks a question.

374—H. Penberthy answers, saying, 1150 gallons to a revolution will work a six-inches bucket, six feet stroke, from sixty five to eighty fathoms deep, and refers the public to Godolphin Mine, in Cornwall, and Wheal Friendship, in Devon.

391—O. Harkless expressed himself obliged to Mr. Penberthy, saying, that the tables found in the *Practical Miners' Guide* is a very near calculation.

411—Mr. James Whitelaw, some new water mill, fifteen inches diameter, but he did not say what duty this steed wheel would perform in pumping water from a mine.

413—I observed nothing particular to notice.

And now, Mr. Editor, after giving a compendious sketch, or a chronological statement, of the somewhat warm (but interesting) controversy in which many of your correspondents have been engaged during the last year, I shall now pass on without making any remarks on the *power, construction, propelling by wind,* and *improvements in breast and pitch back,* but pass on to the "Economical Application of Steam-Power"—found in p. 244—which is a most irrational publication. There is no saving of fuel, but the *reverse.* Allowing 300 tons of coals to perform certain work, by pumping water to revolve water-wheels for mechanical movements, 130 tons would perform equal work, with a well-arranged machinery attached to cog-wheels, &c.

A friend of mine, about three years ago, met with an engineer, from Flintshire, who told him that a *certain* waterfall, then named, was equal to 30-horse power; and the same gentleman received a letter from a Cornishman, then residing in Denbigh, saying that a water-wheel would perform 78 per cent., which came very near to the Flintshireman's assertion; but, by referring to Mr. Budge's calculations, alas! it was not twelve!—consequently, he did not go on with the erection of the machinery, although they were ordered, and some part executed. The same gentleman, in the meantime, having had recourse to various experiments, which proved the fallacy of all calculations exceeding 30 per cent. in pumping water from a mine, says he never witnessed 24. On visiting a lead mine, near Rhyl, where there were three powerful wheels pumping water, the best of them did not come up to 23; for further information, I was referred to Mr. Ishmael Jones, Rhualland, near St. Asaph. Those gentlemen who send to the press their vague suppositions to appear before the public as *facts,* are apt not only to impose on but to mislead many. Men of candour, after having had a clear explanation, should (and will) acknowledge their errors, instead of imposing on the community by endeavouring to establish what is wrong. H. MENEVENSIS.

St. David's, Jan. 7.

RELATIVE PROPERTIES OF HOT AND COLD-BLAST IRON.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Mr. Hartop, in his letter to you of the 2d inst., states, in allusion to "Alpha's" letter to you of the 28th November, that he quite agrees that experiments of any individuals upon their own iron as compared with that of others, are of no worth, and ought not to be published with a view to the settling of the question of the comparative merits of hot or cold-blast in the manufacture of iron; but if a man, for the purpose of gratifying private malignity, makes a direct outrageous attack upon the character of the produce of any particular works, and bolsters up such attack by a wilful suppression of important facts, a tortuous application of others, and a general mystification and perversion of such as he uses in all his statements, why then, I assert, that persons so attacked, should immediately, by a course of experiments, prove whether the allegations were well or ill-founded. That course Messrs. Graham and Co. adopted, and the results were truly described in their letter to you of the 14th inst.; that statement Mr. Hartop has thought fit to impugn, and in his letter of 2d inst., published in your Journal of the 14th inst., he states—"that he has no doubt that in all future trials those with the least principle would have the best chance;" that he acts upon this conviction I am satisfied, or he would not deal out right and left (as for some time past he has done) statements and insinuations so utterly devoid of truth. In making his attack upon Milton iron, Mr. Hartop quoted Mr. Fairbairn's experiments, so far as to show a superiority of Elsecar cold blast over Milton hot blast, in the power to resist impact; but he suppressed the following, all greatly in favour of Milton iron, as compared with Elsecar—viz., in the specific gravity, modulus of elasticity, breaking weight, and ultimate deflection, added to which the same table of results published by Mr. Fairbairn shews that of six works, making both hot and cold-blast iron, four cases prove a decided superiority in hot-blast iron—viz.:

	Breaking weight.	
No. 2—Devon hot blast	537	
Ditto cold blast	448	—89 lbs. superiority of hot-blast.
No. 3—Ordinary hot-blast	[illegible]	
Ditto cold blast	[illegible]	—73 lbs. ditto ditto.
No. 3—Carron hot blast	527	
Ditto cold blast	[illegible]	—64 lbs. ditto ditto.
No. 3—[illegible] hot blast	[illegible]	
Ditto cold blast	[illegible]	—3 lbs. ditto ditto.

Does not this, Mr. Editor, convict him of suppression of important facts? Mr. Hartop, at Bradford and other places, as well as in your Journal, stated that in March, 1842, the price of No. 1 hot-blast Scotch metal at Hull was [illegible]

was cast, and it stands its work well. All that statement I declare to be false; no such rapid breakage ever occurred, and no shafts have been cast for many years from cold-blast iron at this place. I know not who the "miscreant spy" may be who has seasoned a dish so grateful to Mr. Hartop's palate, but I wish that gentleman joy of his alliance, although I recommend him to remember the proverb—"If there were no receivers, there would be no thieves." JOSEPH PARKER.

Milton Iron-Works, near Sheffield, Jan. 16.

COAL AND METALLINE FORMATIONS.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Your correspondent, "A Workman," as I anticipated, is "trotting himself out," quickened, no doubt, by the spur kindly applied for this very purpose. He starts fair enough, with the ostensible purpose of giving facts coming under his individual observation, illustrating his facts by diagrams—so far, his labours were appreciated by those to whom all such facts are valuable, but, suddenly, his vanity overcoming his assumed simplicity, we find him plunging headlong into theory. Admitting that what he has previously written is a correct detail of facts, still there is nothing in those facts to warrant the conclusions he has drawn, and, if we are to theorise, I presume we can do so in a much more rational manner, than by the very heterodox idea of the "bursting of the coats of the great onion," which, as now appears, is the main object of "A Workman" to establish. Passing by Mr. Deakin's ideas of the unchangeable state of our mineral beds, I believe it to be admitted by all scientific men, that the greater portion of our coal beds are produced by sedimentary deposition, in common with the overlying, underlying, and intervening beds of shale, sandstone, &c.: the bed on which this sedimentary deposition takes place may be parallel to the horizon, but in, perhaps, the majority of cases, these beds must have abounded with inequalities, and, consequently, the form and direction would be given to the overlying matter, the mineral being uniformly disposed over the whole surface, and, consequently, of uniform thickness of seam, unless altered by substances in contact with it. I cannot think that "A Workman" has come to the absurd conclusion that all mineral beds were primarily disposed on plane surfaces, without *faults* or dislocations of any kind, for every-day experience proves the contrary. I will take, for instance, the great wall of China, so unluckily pressed into his service; it is nearly uniform in length, breadth, and height, and carried over mountain, hill, and dale. Supposing that this portion of the earth became engulphed, and successive depositions of matter raised the plane to the level of the highest elevation of the wall, the soil is explored, and men come to the highest portions of the wall; here, say the scientific, is a treasure of antiquity, but, on following its course, there is a sudden break, or dislocation; the rock on which it is built terminates, but at some ninety feet at the foot of the precipice, the wall is again found—Ah! says the learned geologist, here is demonstrative proof that this portion of the wall has been elevated, and, to prove it, he draws a diagram, similar to that "A Workman" has favoured us with. In favour of the theory of elevation, no one rational argument has been, or can be, proposed, but there is little trouble in finding rational explanations for the several phenomena. In the first place, we well know that lateral pressure has vast influence in converting clay into clay-slate, and thereby condensing its volume, and the same may be said of other mixed material. Again, cavernous bases sometimes give way, and the overlying matters gradually or suddenly sink into the aperture—Derbyshire abounds with such caverns. Again, in early epochs the earth becomes cracked, rent, or falls asunder, the faults being filled up with the disjointed material of the beds, and sometimes with extraneous matter. Again, as before observed, the primary bases on which the beds rest are of rough broken surfaces, or full of inequalities, as is manifest in the Virginian coal beds. And, lastly, but the most favoured of "A Workman," subterranean explosive forces may cause changes of level and dislocations. Earthquakes have rent much of the solid strata of the superficial beds of the earth—explosions of the gases have done the same—and internal fires have altered the general character of the beds; but in all these cases the effects produced are evident—there is no one instance of bodily elevation of the earth's beds, without accompanying marks of violence, nor can the uplifting theory be advocated without doing violence to Nature. "A Workman" would beg one-half the question from Mr. Deakin, and place his own construction on the rest; but, after all, for the simple reasons above assigned, Mr. Deakin may be right, and what he says of mines coming within his own practical knowledge is applicable, as my own experience proves, to the majority of mineral beds and seams, and I re-echo the opinions of this practical miner, that the seams of coal and iron mine may strictly correspond on one side of the dislocation and the other, and yet such may never have been united; and, further, that the elevations and depressions may be such as when primarily disposed, without alteration in the position of the bed from time or accident. Your correspondent, "A Workman," should now bring forward opposing facts, known to every practical miner. A COLLIER.

Littleton, Jan. 25.

PRACTICAL MINING.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Your correspondent, Mr. Deakin, in his zeal for a good cause, commits an act of injustice to the scientific portion of the community. He asks—"Has any schoolman ever, in any one instance, been of any service in draining a mine, or has he been of any service to the miner after he has drained the mine?" Yes, Mr. Deakin, for the drainage of your mines, for your comfort in ascending and descending, for your security in working the mine, you are indebted to those whose learning appears to offend you. Who gave you the safety lamp?—Sir Humphrey Davy. Who the steam power?—Watt. Who the hydraulic machines, and numerous other inventions?—Scientific men, who were no miners. But for scientific men, many mines would never have been discovered, and, if discovered, would never have been worked; your mattock and spade was a poor resource in the hands of your forefathers. To the chemist you have still to look for your safety—to the effective force of machinery you have still to look for your profit—you are right welcome, Mr. Deakin, to dethrone humbug, but not to exalt ignorance, a still more dangerous divinity, in its stead—you are welcome to think that the world is made, but men of science know that the world is making, that mines, rocks, earths, mineral beds and veins, all are continually being made or created, that where the waters once were is now dry land, and lands once revelling in fertility are now hidden beneath the waters, and every day, in despite of Solomon's wise saws, there is *something new* under the sun. Lord Ashley, the regenerator of mining virtue, will do well, by educational enactments, to teach your miners modesty, to read and to understand the numerous facts (apart from all theory) collected by men of science. Arrogance in a schoolman is much more tolerant than the arrogance and presumption of men who know little beyond the narrow circle in which they move; a little learning is a dangerous thing. J. S. D.

Oxford, Jan. 17.

ON THE FORMATION OF MINERAL VEINS.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Your correspondent, "T. H.," of King's College, pays a very poor compliment to his own understanding, or to the talent of his geological professor. The specimens he seeks are, doubtless, beyond *his* surface discoveries, but they do exist, scattered like gems in ancient lore and antiquated rubbish. He is truly unfortunate in the authority he quotes; Mr. Lyell is in the advance of geologists, but he is far, very far, behind the spirit of the age; his industry in collecting facts is unquestionable, but his perversion of those facts is intolerable, and his numerous *ifs, probabilities,* and *qualified versions,* are more suited to the meridian of novel readers, than to the light of philosophic inquiry: his supposition that lime-secreting polypi draw their supply of clothing from subterranean springs, issuing from the bottom of the ocean, is well worthy the age of Ray and Lister, who imagined that fossil shells were *lapides sui generis,* produced in the earth by some extraordinary plastic nature: his ideas of gradual *elevation* and *depression,* of the *changes of temperature* the *earth* has undergone, of *progressive development of species,* &c., certainly entitle us to demand some little better explanation than is given. "T. H." is satisfied with Mr. Lyell's notions on coal; let him now speak for himself—"Coal is of vegetable origin, growing on or near the spot where deposited, indicating *lacustrine deposition*"—"occasionally formed in an estuary"—"some of the coal fields of Scotland, formed by the drifting of plants into the sea." Again, "the bituminous shales, as also many stratified deposits of bitumen and pitch, seem clearly to attest that, at former periods, springs in various parts of the world were as commonly impregnated as now with bituminous matter, carried down, *probably,* by rivers into lakes and seas," &c. This is the sum and substance of information given on so important a subject, purloined from Kirwan and others, and with the same unsuccessful issue. "T. H.," I fear, has not yet passed the threshold of natural philosophy. "Geologicus" gives facts, his antagonists exclaim give us authorities—he speaks practically of the *universal* decrease of the waters—he gives the causes of that decrease—he entertains no such absurd notions as elevations and depressions of continents or of seas—he speaks of changes which must inevitably have taken place in the disposition of the earth's surface—he is fully prepared to prove, when the opportunity is afforded him, all that he asserts. "T. H." will find the information he asks in various works by Silliman and other American authors; the disturbed state of the Virginian, and also the *Pennsylvanian,* coal-fields, are well known, although not alluded to in the brief remarks noticed by "T. H." GEOLOGICUS.

Jan. 19.

ANTHRACITE WITH COLD BLAST.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—I had hoped, ere this, that some results would have been communicated through your columns on the economy of cold-blast being applied to anthracite, in the smelting of iron, and the advantages arising from the construction of the large furnace. It is rumoured here, and on no mean authority, that the three furnaces at Ystalyfera—that is, two of twelve feet bosh, and one of sixteen—make together somewhere about 100 tons weekly; whereas, when the two smaller furnaces were in operation with hot-blast, the make was nearly equal to that which is the produce of the three, it being contemplated that the large furnace would make a far increased quantity. Now, even allowing a falling off of one-fifth in the small furnaces, from the alteration of hot to cold-blast, reducing the make to forty tons each, or together, eighty tons, this would only leave twenty tons as the difference of make, for which the big furnace should have credit, which evidently must be wrong. Anxious to be set right in this matter, and that Mr. Budd's patent should not be prejudiced by false reports, possibly got up for interested purposes, I shall be glad if you will give this letter, or the substance of it, insertion in your valuable Journal.

Swansea, Jan. 24. R. T. M.

[*We shall be glad to give insertion to any data which may be authenticated on the subject. "R. T. M." evidently writes for information, although his letter appears to us to blow "hot and cold."*]

COAL FORMATIONS.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Your correspondent, "A Workman," has favoured us with samples of practical knowledge respecting the nature and appearance of the dislocations and faults of coal fields. I trust he will still continue his self-imposed task—so pleasing to your numerous readers—and give the most striking deviations from the courses laid down, for we all understand that such as he has given is the correct representation of beds familiar to him, but we cannot admit them as proofs on which to generalise or lay down particular laws. Mr. Deakin tells him his joints won't fit; perhaps this practical miner will give his reasons for so saying—the subject is most truly interesting, and I trust that, now the ground is broken, other practical workmen will be induced to follow their example. What does Mr. Hopkins's friend, the "Mining Captain," say to the answer elicited from Mr. Deakin? It will be as well for your correspondents to mention the nature of the material of dykes, and of the coal when in its altered, or, as the miners' erroneously term it, *burnt* state; and, again, the exact direction of the mineral beds. "Facts are stubborn things," Mr. Editor, and theories, although founded on facts, must eventually give way when found incompatible with the workings of Nature. J. H.

Rotherham, Jan. 18.

FORMATION OF MINERAL LODES.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Observing how much you were pressed with correspondence, I have refrained from writing during the last fortnight, although I have been shot at by your Oxford "J. S. D.," "A Tributer," and other bush-fighters, who are ashamed, or afraid, to appear in the open field; but I had an especial call from one of the same school last week, who conceals himself under the cognomen, "Geologicus," who says—"Messrs. Deakin, Budge, and Co. advance theories, and leave them to abler heads than theirs to dispute, or confirm, these theories;" moreover, I see that my practical brethren are in the field, fighting hard against the theoretical monster, and I think it will be admitted that Cornwall, with all her failings, was never yet branded with cowardice.

As a preliminary to forthcoming practical subterraneous developments, I will, with your leave, in this letter, confine myself to one subject, which I have not yet seen introduced, and to which I respectfully invite the attention of all parties who take an interest in this investigation. This subject may appear insignificant, at first view, in the opinion of some, and especially among the prejudiced and inexperienced, but to the candid inquirer after truth, I am persuaded it will carry considerable influence to his judgment, amounting to an "almost," if not an "altogether," conviction, that mineral lodes and the ground, or rock, containing them, were formed at one and the same period. Now to the point; who, among us, Mr. Editor, whether miner or F.G.S., has not often seen and examined the veins in various species of stone that have been dug out of mines and quarries, and observed the exact resemblance and order (in miniature) in these specimens, to the great and grand formation, and disposition of every kind of metallic lode in the country? I intended forwarding a drawing of one of these *evidences,* in which nearly all the phenomena of metallic lodes were most faithfully modelled and pourtrayed. In a stone of granite, slate, porphyry, limestone, and other kinds, not exceeding a cubic foot in dimensions, we often find it traversed by little lodes and cross-courses, so exactly imitating the disposition of great metallic veins, that a correct drawing of it might be mistaken for the plan and sections of a mine. Thus, on the top surface, as it lay in its bed, may be seen, if you please, the working plan of the upper or adit level. Here we see the course of the lode, with its deviations, the split of the lode "by a horse," and the branches again coming together; another split where one branch terminates, or, as miners say, "dies away in the country," and does not again join the main part of the lode. Here we have the mysterious cross-course intersecting the lode, sometimes at right angles, and sometimes obliquely, now passing through it without deviating in its course, and another showing most distinctly the celebrated *heave*—apparently, removing one part of the lode from the other. Here also we have all the phenomena of two lodes forming a horizontal junction; occasionally uniting and continuing as one lode, and at other times crossing each other, and continuing their respective course. If we leave the surface of the stone, and examine one end of it, in the line of the lode (the transverse section), here we observe the dip, or underlay, with its variations. Now we may discover the effect of a *slide,* provincially said to *throw* it up or down, the circumstance being occasioned by an oblique, or parallel, lode, intersecting it by an opposite declination. Here, also, we have the miner's "droppers," or little branches falling into the lode. In short, I know of nothing that has ever been discovered in a metallic lode, but what has been prefigured, or represented, most distinctly and perfectly in those various specimens?

And now, Mr. Editor, who among us (reasoning from analogy) will not admit that this furnishes us with a most powerful pleader for the theory of contemporaneous formations? None, I think, will be found so deeply poisoned with *geo-logic* potions, as to contend, or even imagine, that the stone was formed at one period, and the little veins at another! and I doubt not, but we shall bring forward ample corroborating proofs from underground operations, to show that it would be equally absurd to suppose that the lodes were formed at one time, and the country which incloses them, at another. Let the schoolmen ask the miner what advantage the cross-courses are to him; and what will be his reply? Oh! he will say, I can drive my cross-cuts, or transverse levels, from one lode to another, on a cross-course, generally, for less than one-fourth part of the money, and in a fifth part of the time, that I could drive them through the country; moreover, their benefit, in occasionally sinking on for shafts and winzes, and especially their vast usefulness in stopping back, or damming up the water, is incalculable. Oh! Sir, let me assure your readers that the amazing wisdom and benevolence displayed in the arrangement of metallic lodes, and all their phenomena, deserves the deep attention and admiration of mankind.

Lastly, Sir, let us inquire why the geologists are so unanimous, in contending against the contemporaneous formation of metallic lodes and the country? I think I can reveal the secret. It is this. They have published to the world that one species of rock was made at one time (primary), another kind, at another time (secondary), another (tertiary), with other *errors,* in succession. Now, as the lodes traverse promiscuously through nearly all these *formations,* it gives a decided negative and death-blow to their *established doctrines,* and if it can be proved that the lodes and country were created together, it will effect the overthrow of almost, if not all, the theories of geologists.

Callington, Jan. 16. JOHN BUDGE.

HYDRAULIC PROPULSION—MR. SHUTTLEWORTH IN REPLY TO THE EDITOR OF THE "CIVIL ENGINEER."

TO THE EDITOR OF THE MINING JOURNAL.

[Concluded from our last.]

In your next (fourth) paragraph you state that I make "various calculations for the purpose of showing the economy of my system of propulsion, compared with that ... [illegible]

[illegible] ... arrangement of the hydraulic railway. J. G. SHUTTLEWORTH.

Bath, Dec. 13, 1842.

[For continuation of "Original Correspondence," see p. 39.]

NEWPORT AND NANTYGLO RAILWAY.—Mr. Crawshay Bailey, of the firm of Bailey Brothers, the ironmasters, of Nantyglo, has not only given his consent for the line to pass through their property, but has taken a considerable interest in the shares of the undertaking; and we are happy to hear that everything connected therewith promises the carrying out the completion of the railway, to the greatest possible advantage. It appears that the proceedings in Parliament will be conducted by the provisional committee, whose personal services will be given gratuitously; and that the election of directors for carrying the line into effect will be postponed until after the passing of the Act; the shareholders will thus have the opportunity, not often afforded in public companies, in the first instance, of choosing their own managers. This arrangement affords the highest testimony of the legitimacy of the undertaking; and of the sound views, and honesty of purpose, of its projectors. One of the most indefatigable of the latter (Reginald J. Blewitt, Esq., of Llantarnam Abbey,) has just published a letter, in the *Monmouthshire Merlin*, showing the self-creating traffic of railroads, and the saving the line in question will prove, even to the working collier, and labouring population generally, of this great district. This line, like every new project, good or bad, has its opponents; and they are now pretending to disbelieve the calculations upon which this undertaking is founded. There is, however, we believe, but little doubt of their correctness; or but that the railway will ultimately prove of the utmost convenience to the neighbourhood, and a source of profit and safe investment to the shareholders.

COMMUNICATION WITH SCOTLAND BY RAILWAY.—The Newcastle and Darlington Junction Railway is now in rapid progress, and it is confidently expected that in less than two years, the line will be completed, and thus open an uninterrupted communication between London, Newcastle-upon-Tyne, Durham, Sunderland, Gateshead, and Shields; thus adding another forty miles of railway on the great road to Edinburgh. The average estimate of the cost of the line as laid before Parliament, was 20,000*l.* per mile, but the heaviest works are contracted for at less than was anticipated, and it is generally considered that the actual outlay will not amount to that sum. The price of iron, as well as labour, is little more than one-half what it was ten years ago, and from the calculations of the expected traffic which have usually been under rather than over the amount, it is confidently anticipated that this line will pay 10 per cent. to the shareholders. The Newcastle and Darlington Junction line must merely be regarded as a stepping-stone to the line through to Edinburgh, thus uniting the principal towns in Scotland with London, by railway communication, and, no doubt, a journey from the latter place to Edinburgh will then be calculated by hours instead of days, or even weeks, as under the old system of travelling.

TAFF VALE RAILWAY.—On Wednesday, the 18th inst., a special general meeting of shareholders in this railway, which seemed to excite but little interest (not twenty persons being present) was held at the Angel Hotel, Cardiff. The following resolution was passed:—"That the directors be, and they are hereby authorised to raise and take up at interest, at the rate of 5 per cent. per annum, on mortgage of the undertaking the sum of 35,000*l.*, as authorised by Act of Parliament of 3d and 4th Victoria, cap. 113."

BANKING IN NEW SOUTH WALES.—From the sworn returns rendered, pursuant to the Act of Council of 4 Vic., No. 13, of the average assets and liabilities, and of the capital, and profits of the banks of New South Wales, for the quarter ended December 31, 1842, they appear to be in a flourishing situation. The New South Wales Bank, with a paid-up capital of 195,375*l.*, has paid a dividend of 14 per cent., and placed 6000*l.* to the reserve fund. The Bank of Australia, capital 10,125*l.*, dividend 12 per cent., and 5000*l.* reserve. The Commercial Bank, capital 92,492*l.*, dividend 12 per cent., reserve 10,433. Bank of Australasia, capital 92,893*l.*, dividend 8 per cent., reserve 64,393*l.* Union Bank of Australia, capital 375,300*l.* dividend 10 per cent., reserve 22,000*l.* Sydney Bank, capital 150,021*l.*, dividend 11 per cent., reserve 3516*l.*; and the Bank of Port Phillip, with a paid-up capital of 71,000*l.*, has paid a dividend of 10 per cent., and carried to the reserved fund 1000*l.*

LECTURES ON GEOLOGICAL MINERALOGY.

Mr. Tennant delivered his first lecture, of the second part of the course, at the King's College, on Wednesday last, during which the acidiferous earthy minerals were commented upon, including Websterite, or the subsulphate of alumina, and Wavellite, or the sub-phosphate of alumina. The lecturer regretted that, when the chemical properties of minerals were known, the name of the discoverer should be given to them, as that proceeding tended to confuse the mind of the student. Carbonate of lime was the next substance treated upon, which was stated to compose one-tenth of the whole globe, and had upwards of 1000 different forms of crystallisation, the nucleus of all of which was the rhomboid, the angles being 105° 5' and 74° 55'. The lecture was illustrated by a large variety of specimens, and was of unusual interest. The application of the compact carbonates of lime to building and ornamental purposes, will be treated upon in the next lecture.

IRON TRADE IN AMERICA.

Advices, dated Philadelphia, Dec. 19, announce the iron trade to be increasing rapidly. In 1832 it employed 27,000 men, and turned out 191,530 tons of pig and 112,866 of bar. The following are the iron statistics for 1840:—

Pig-iron	tons	286,903
Furnaces		804
Bar-iron manufactured	tons	197,233
Forges and rolling-mills		795
Men employed		31,000
Fuel consumed	tons	1,528,101
Capital invested		$20,432,131

It is thus divided into States:—

	Furnaces.	Pig.	Forges and rolling-mills.	Tons produced.
New York	196	29,088	120	53,693
Pennsylvania	213	98,395	169	87,247
Virginia	42	18,810	52	5,5[illegible]8
Ohio	72	35,236	19	7,466
Kentucky	17	29,206	13	3,637
New Jersey	26	—	94	—

LAWS OF MINES AND MINERALS.

A question of considerable importance, as affects the working of mineral property, has lately occupied the attention of the law authorities in the island of Guernsey. A special meeting of the Royal Court having been convened, for the purpose of taking into consideration the report of Messrs. Le Retilley and De Havilland, respecting a complaint made of certain springs and wells having been either dried up, or otherwise affected, by the working of the Blanche-lande Mines. From the report, we find that a spring, at Mount Durant, in the parish of St. Martin's, from which the inhabitants had from time immemorial obtained their water, was entirely dried up since the 20th of last month; and that several wells in the neighbourhood had considerably diminished in their supply of water; and it accordingly recommended the suspension of the mines until the matter could be further inquired into. Mr. TUPPER (advocate) in supporting the interests of the mining company, contended that the court could not be justified in so serious a proceeding as that of suspending the works. The company were working on Mr. Lefebvre's land, of which he was not only lord of the manor, but absolute owner of that part they were now excavating. The suspension of the works would cause a very heavy loss and injury to the company; and who was to repay them for such loss, in addition to the cost of carrying it before the Privy Council? He contended that the subsoil, and the riches it might contain, were indisputably the property of the lord of the manor, who held his fief direct from the crown; this was the acknowledged law in regard to manorial rights, and had always been acted on in mining districts.—The QUEEN'S PROCUREUR, in support of the report, denied the doctrine, as laid down by Mr. Tupper, that the freeholder had any right to work under the property of others; and the COURT eventually decided that, the mines should be suspended for one month; and that, if an action was not brought within that time, for the purpose of trying the question of right, the suspension is to cease.—During the hearing of the case, Sir W. COLLINGS said, he would rather see any injury which might have been sustained by the public, compensated, than do anything to injure the working of the mines; and, subsequently, expressed strong doubts whether the Court was justified in taking on itself the serious responsibility of stopping the works.

PROBABLE DURATION OF THE SUPPLY OF COAL IN GREAT BRITAIN.

Although the present known coal fields of Great Britain contain, perhaps, sufficient coal to supply her wants for 2000 or 3000 years to come, it is a very erroneous basis of calculation to assume that the whole is at our disposal. Under the present system, in the finest description of coal of the northern field, there is even, in its extraction, a loss of 36½ per cent. The views of theoretical geologists, without allowing for waste, would lead to the most incorrect practical conclusions, while Conybeare, Lardner, and others, would make our coal resources sufficient for 1500 or 2000 years, Professor Sedgwick and Dr. Buckland, allowing for loss in working, calculated, from practical experience, are convinced that 400 years will leave little more than the name of our best seams. A report of the *South Shields Committee appointed to Investigate the Causes of Accidents in Coal Mines*, just published by Longman and Co., contains much useful information on this and other subjects connected with our coal districts, and to which we shall have occasion to refer on future occasions, from it we now extract the following details, which will corroborate the above views:—"Of forty-five feet of coal in a section of all the coal strata, in one of the best pits of the Tyne, not thirty feet are workable. In the north, coal cannot be extracted at a profit, if less than 2 ft. 6 in. In the western part of Wall's End, the Bensham seam is considered unworkable at 2 ft. 10 in., though there are times when it is worked at twenty inches. The thinnest seam worked in Yorkshire is thirteen inches, in North Lancashire twenty inches, in the Northumberland and Durham districts 2 ft. 6 in., St. Lawrence 2 ft. 9 in.—most of the thin seams above, are worked for local consumption, and cannot bear the expense of transit and competition for manufacturing and commercial purposes. Already the Tyne portion of the northern coal field begins to feel the difficulties of exhaustion in the finer description of coal, and that of the Wear and Tees, less worked than it, has the advantage, in commercial competition, of from 8 to 10 per cent. in price."

LIGHTNING CONDUCTORS FOR SHIPS.

In two former Numbers we inserted some correspondence from Mr. Murray, of Lichfield, on this subject, and previously having made some remarks on a lecture delivered by Lieutenant Sabben at Portsmouth, we now notice a reply of the latter gentleman to a lecture delivered by J. Fincham, Esq., at Chatham (one of the committee appointed by the Commissioners of the Admiralty, to receive evidence relative to marine conductors for lightning). The lecturer evidently favoured the plan of Mr. Snow Harris, which has been styled by Lieutenant Sabben, "a bewildering right-angled, zigzag process." Without going deeply into the merits of the several plans, we will merely describe them, and give some of Lieutenant Sabben's reasons for his objections to Mr. Harris's system. Mr. Snow Harris imbeds strips of copper in the mast, down to a point within the deck, then horizontally along, under the main and orlop beams, and through the hull into the sea. Lieut. Sabben not only objects to the *imbedding* principle, but also to the numerous angles incidental to this mode; he strongly advocates free and unattached conductors, and contends that electricity, as it passes along an artificial conductor, occupies its entire surface, and revolves round it; and, therefore, requires to be free, and entirely unconnected with any other substance; he, therefore, uses wire rope (Smith's patent) brought from the mast head, over the ship's side, as little curved as possible, and without angles. Mr. Murray, who has for twenty-five years made electricity his study, bears out Lieutenant Sabben in his view of the inefficacy, and even danger, of Mr. Snow Harris's conductors; he contends for a "round and smooth surface," in as little connection as possible with any other substance, and, therefore, for his conductors, he uses copper piping, fastened by iron holdfasts, prevented from oxidation, on the galvanic principle, by strips of zinc. The question is one of immense importance to the shipping interest, as well as to the attention of Government, and there is no doubt the most safe and effectual will eventually come into use, whatever may be the extent of favouritism alluded to by Mr. Murray in his communication, and also by Lieutenant Sabben.

MINING COMPANY OF IRELAND.—The following gentlemen have been unanimously elected directors for 1843:—Edward Atkinson, Francis Barker, M.D., David Roche Blood, Francis Augustus Codd, James Dawson, Isaac English, James Gray, Robert R. Guinness, James Magee, Thomas Mooney, John O'Neill, James Perry, Thomas Pim, Wm. Stephens, and Robert Tuty.

NATIONAL ASSURANCE COMPANY OF IRELAND.—At the half-yearly meeting of this company, held on Thursday, the 19th inst., at the office of the company, 3, College-green. Mr. Thomas Pim in the chair. It appeared from the directors' report and accounts, read by the secretary, that a net profit had been realised during the half-year, ended 31st of December, 1842, of 7997*l.*

THE BRITISH AND IRISH STEAM PACKET COMPANY.—The annual general meeting of the proprietors of this company was held on Wednesday, at the office, 3, Eden quay, when the directors' report was read, and a statement of accounts submitted. A dividend of 6 per cent. per annum was declared as usual, and a surplus added to the reserve fund. The company's vessels continue to be insured. The directors going out of office by rotation, were unanimously re-elected, and three auditors having been elected, the meeting broke up.

NEW PLAN FOR THE BETTER VENTILATION OF MINES.

BY W. TAYLOR, ESQ.

Having observed that the attention of some of your correspondents has been directed to the subject of the ventilation of mines, I venture to forward to you a proposal of mine, which has been sanctioned by the approbation of several eminent practical men, to whom I have submitted it. In order to explain the efficacy of it, I think it important to define the term "impure air," considered relatively to mining operations, and to state at length two general facts connected with the movement of air, and then to show, that, in conformity to such definition, and such general facts or laws, the mode I propose will lead to the desired end.

First, as to the definition. The impurity of air in mines arises from four causes:—1. The presence of carbonic acid gas. 2. The presence of carbonated hydrogen gas. 3. The too great moistness or too little dryness of the air. 4. The presence of noxious exhalations, arising either from metallic ingredients, or corrupt animal or vegetable matter. A very small quantity of carbonic acid gas is sufficient to render the air deleterious. This has always been known, but it is only of late that the exact quantity, beyond which the gas should not exist, that the mixture may remain healthful, has been ascertained by M. le Blanc to be $\frac{1}{100}$th part in volume of the mixture. In order to reason safely, I shall suppose it to be $\frac{1}{100}$th part in volume. Carbonated hydrogen gas is not supposed to be injurious, otherwise than by causing a deficiency of oxygen, or inducing explosions. Therefore, practically, if the quantity is not sufficient to produce an explosive mixture—that is, if it exceeds not $\frac{1}{15}$th in volume of the mixture—no inconvenience will arise from its presence. In regard to the moistness of the air, pulmonary or cutaneous transpiration can only take place by the dissolution or suspension of the humors, or aqueous matter, secreted from the body, in the air. In the ordinary state of the atmosphere, it is always adapted for such secretions, because, even in its most humid state, it contains only $\frac{4}{5}$ths of the quantity of vapour required for its saturation. But, if the air descending from the surface takes up the other $\frac{1}{5}$ths in the mine, transpiration becomes impossible, and immediate moistness and remote disease are the consequence. In regard to exhalations, medical science discovers every day more and more their pernicious effects, not only on the body but the mind. By impure air, then, I mean air which contains more than $\frac{1}{100}$th part in volume of carbonic acid gas, or more than $\frac{1}{15}$th part in volume of carbonated hydrogen gas, or more than $\frac{4}{5}$ths of the moisture requisite to saturate it, or which is replete with injurious exhalations. The very statement of this definition shows that the problem of effecting a good ventilation, resolves itself into the problem of making such a quantity of atmospheric air course through the mine, that the mixture of the air descending from the surface, and that generated in the mine, be not comprehended in the above definition.

Now, to understand how this may be brought about, it will be useful to give attention to two general facts:—1. That if the movement of air is produced by an air-pump, or other aspirating machine, or by the difference of weight of two columns of air, the velocity of this movement will not be affected by the length of the course of the air. It is difficult to explain this, yet experiment and observation indicate it to be a fact of such uniformity and generality, that it may be assumed as a law. In regard to experiment, it has been found, that if barometers are inserted at different distances in a long tube, and aspiration by an air-pump takes place at one end, the other being shut, all the barometers will, at the same instant, stand at the same height; and, in regard to observation, it does not appear, in the mines of the county of Durham, that the length of the air course, or the frequency of its turnings and windings, however abrupt, diminishes the efficacy of the motive power. If this be invariably true, then, in all inquiries as to the proper mode of ventilating, it may be assumed that the column of descending air is contiguous to the column of ascending.—2. The other general fact is of equal importance, and quite explicable. I shall state it in the words of M. Peclet:—"In the case of the movement of the air being effected by a difference of weight, arising from difference of heat in the ascending and descending column, the accessional velocity will be equal to the space which a body would describe in falling from a height equal to the dilatation which a column of cold air, of the length of the canal, would experience in passing from the exterior to the interior temperature; for example, the exterior air being at 0°C, the interior air at 100°C, and the canal being fifty metres high, the dilatation which a column of air of fifty metres would experience in passing from 0°C to 100°C would be $50 \times 100 \times 0{\cdot}00375 = 18{\cdot}75$ metres. Now, a body which would fall from this height would acquire, at the end of its fall, a velocity of 19·18 metres per second. Such, consequently, would be the velocity with which the warm air would escape from the canal—indicating by h the height of the canal, by t the temperature of the exterior air, by t' that of the interior air, and by m the co-efficient of dilitation of the gases; the generating height will be $h\,m\,(t'-t)$, and the velocity $v = \sqrt{2\,g\,h\,m\,(t'-t)}$."

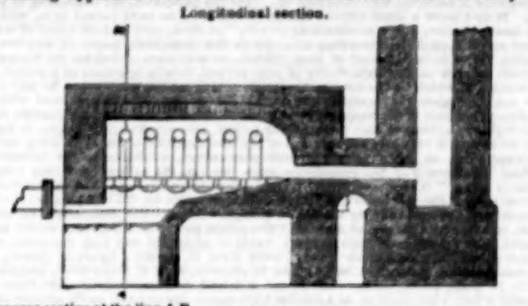
This is a very simple rule; but the question here arises—Can it be rigorously applied as a practical direction? Are there no other inappreciable circumstances, which ought at the same time to be considered, which might affect the conclusiveness of the general rule? I can only say, so far as my own observation or experience goes, I know of none, and that after an adequate correction has been made for the increased weight of the ascending column, arising from the presence of bodies of an increased specific gravity, as carbonic acid gas, oxide of carbon, or carbon in the form of smoke, or the increased specific heat (in volume) of the mixture, arising from the presence of such bodies, or other causes whose operation is evident, the velocity indicated by the formula will be found that which actually takes place. Assuming, then, as laws, that in the case of movement by the agency of a heated ascending column, the velocity is not affected by the length of the air course; and that the actual velocity may be found in all cases, by inserting particular values in the general formula, I shall consider a mine in which there are 300 workmen of every kind, and I shall inquire what quantity of air ought to be made to descend, in the several cases of there being no other impure air generated in the mine than what is produced by the respiration or perspiration of the men, and the combustion of their lamps or candles? of carbonic acid gas being otherwise disengaged in the mine? and of carbonated hydrogen being disengaged?

As to the first case, on reference to the statements by Heron de Villefosse, A. M. Boisse, Peclet, Hood, Bird, and others, and on paying attention to the circumstance, that a man in action requires double the quantity of air of a man in repose, it will be found that 300 workmen, with their lamps, require, for perspiration and combustion, about eleven cubic metres per minute, and that they produce one cubic metre of carbonic acid gas per minute. Therefore, in order that the air, in such a case, may not be comprehended in the definition of impure air—that is, that it may not contain $\frac{1}{100}$th part in volume of carbonic acid gas, it is necessary that at least 100 cubic metres per minute be made to descend. And on reference to the statements, by the same and other authorities, and making allowance for the difference of action and repose, it will further appear, that the 300 men required for their pulmonary and cutaneous transpiration, 100 cubic metres per minute of dry air—that is, of air, which can still absorb $\frac{1}{5}$th of the vapour necessary to saturate it. But it would not be sufficient to make this quantity of air descend, in order to preserve health, because a considerable quantity of vapour would be produced by the combustion of the lamps or candles—because a quantity of vapour would be disengaged from the works—and because the quantity which courses must be in such an extent as to keep the degree of humidity distant from the point of saturation, for, near that point, the absorption of the humors would not take place with sufficient rapidity. There ought to be at least 300 cubic metres per minute.

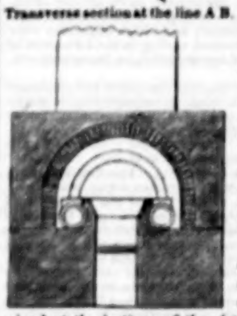
As to the second case, that of carbonic acid gas being produced otherwise than by the breathing of the workmen, and the burning of their lights, the greater number of mines are comprehended in it. Almost always there is a disengagement of carbonic acid gas in the mine, particularly in the old workings, and sometimes to a very great degree. If we suppose, when the disengagement in the works is strong, that the quantity is five times that given out by the breathing, then, in order that the mixture may not be comprehended in the definition, 500 cubic metres per minute must be made to descend. As to the third case, that of carbonated hydrogen being disengaged in order that the mixture may not be explosive, the quantity of air which must be made to descend must often be very great; 850 cubic metres per minute have been found in one mine inadequate. I should suppose that 1500 cubic metres per minute would suffice. To resume, I think that, where there is no carbonated hydrogen gas, the descent of 500 cubic metres per minute, and, where there is carbonated hydrogen gas, the descent of 1500 cubic metres per minute, will sufficiently ventilate a mine where there are 300 workmen.

In regard to the means and expense of procuring the necessary quantity of hot air, and of applying it at the bottom of the shaft of ascent of the air, I conclude, from experiments I have made, and from the laws relative to forced air, which are well known, that, in order to make these quantities of 500 and 1500 cubic metres per minute descend, course, and ascend, in the respective cases (the shaft of the descent of the air and of the ascent of the air being each 300 metres deep, and their bottoms on a level), it will suffice to transmit twenty cubic metres per minute of cold air heated to 300°C, which will then become forty cubic metres per minute of hot air to the bottom of the shaft of ascent of the air, and that a 3-horse power engine will effect that transmission in a tube of six French inches diameter. I propose that the air should be heated on the surface at the top of the shaft, in an apparatus of the kind used at smelting-furnaces for the hot-blast. The expense of such an apparatus, together with a steam-engine of 3-horse power, a blast cylinder of requisite dimensions, and 300 metres of a 6-inch (French measure) sheet iron tube, soldered in brass, and of the necessary masonry—that is, the total expense of the apparatus, machinery, and buildings, mounted and erected, would be, in Belgium, 6400 francs (256*l.*) I have received the offer of an eminent contractor to furnish the whole for that sum; and, for the satisfaction of any of your correspondents on this point, I send you, to lay in your office for inspection, a copy of the offer. The heating apparatus is shown in the annexed sketch. The tube may be

Longitudinal section.



Transverse section at the line A B.



fixed on the shaft, by friction, by pressure against timber, and, of course, is curved back at the extremity at the bottom of the shaft. The air would not be cooled above 20°C in the descent, but if there was any apprehension on this ground, the tube might be inserted in another tube, and the vacant space between the two tubes filled with powdered charcoal, mixed with clay. The quantity of coal required for the steam-engine, and for heating air, will be 1150 kilogrammes (1⅛th tons) per twenty four hours.

Let us now examine what will be the effect of the transmission of this quantity of heated air in the respective cases. Suppose twenty cubic metres of cold air heated to 300°C, mixed at the bottom of the shaft of 300 metres deep with 500 cubic metres of air at the temperature of 20°C; the temperature of the mixture will be 32°C; the temperature will have thus increased by 12°C. In order to know the effect produced by this increase of temperature, we must fix on some quantity as expressing the smallest area of transverse section throughout all the canal of passage of the air, whether that is in the shaft of descent of the air, the shaft of ascent of the air, the drift in the mine, or the part where the miners are cutting. That smallest sectional area, wherever situated, will alone and exclusively regulate and fix the quantity of air which courses; I shall suppose it to be three square metres. The first question is—What will be the velocity and quantity if the air is pure, and heated 12°C, the depth of the shaft being 300 metres? The formula, $v = \sqrt{2\,g\,h\,m\,(t'\,t)}$, informs us that the velocity will be nearly sixteen metres per second, to which, the area being three square metres, correspond a quantity of 2880 cubic metres per minute. Now, let us suppose that ten centigrade degrees of heat are necessary to counteract the effect of the weight of the carbonic acid gas produced by the breathing of the workmen, or disengaged in the works, and insert two instead of twelve in the formula, we shall then obtain a velocity of more than six metres per second, to which corresponds a quantity of 1080 cubic metres per minute. Therefore, it appears that the above quantity of heated air is abundantly sufficient to ventilate a mine where there is no carbonated hydrogen. Take the case again of a mine so affected, and suppose that the twenty cubic metres of heated air are mixed with 1500 cubic metres at 20°C. The temperature of the mixture will be 23·6°; the temperature will have increased by 3·6° of the centigrade thermometer. There requires no deduction to be made in this case, because the increased lightness arising from the introduction of the carbonated hydrogen gas will more than compensate the increased heaviness arising from the introduction of the carbonic acid gas generated by the breathing, or disengaged from the works. Inserting 3·6° in the formula, we obtain a velocity of 8·8 metres per second, to which corresponds a quantity of 1560 cubic metres per minute. Thus, we see, that also in the case of a mine affected with carbonated hydrogen gas, the requisite quantity will be obtained.

43, Boulevard de l'Observatoire, Brussels.

REVIEWS.

Observations on the Report of Lieut.-Col. Sir F. Smith, R.E., and Professor Barlow, on the Atmospheric Railway. By THOMAS F. BERGIN, M.R.I.A. Dublin: Hodges and Smith.

This pamphlet, which is devoted to a review of the report presented by the commissioners appointed by Government to investigate the merits of the atmospheric railway, conveys much useful information, while it professes to set the commissioners right on one or two points; and, moreover, to furnish additional evidence of the value and importance to be attached to the atmospheric system. That the success of atmospheric propulsion, so confidently calculated upon by the projectors and advocates of the plan, would effect an almost incredible revolution in the construction of railways, and form a new era in our scientific researches no doubt can exist; and hence the attention of Government being directed to the subject, and the inquiries instituted, the result of which were embodied in a report, submitted to Earl Ripon, as President of the Board of Trade. It cannot be expected that in a *brief* notice of "observations," which apply to the numerous points of the report, that we should be able to follow the author, or to convey even an outline of his views, which can alone be collected from a perusal of the pamphlet, to which it is well entitled, as affording a means of acquiring a perfect knowledge of the system, and (making certain allowances for the sanguine views entertained by the author) of arriving at the advantages which the atmospheric system presents over that of the locomotive mode of transit.

As evidence of the practicability and advantages to be derived from this invention, Mr. Bergin quotes the words of the report of the commissioners, in which they say, "We consider the principle of atmospheric propulsion to be established, and that the economy of working increases with the length and diameter of the tube;" and further, adding thereto, "the atmospheric principle seems, to us, well suited for such a line as the projected extension from Kingstown to Dalkey." Such is the text on which our author builds his discourse; but who, as may be naturally supposed, does not agree with the commissioners in every portion of their report, for, if our memory serves, there were certain observations contained therein, calculated to raise doubts as to the advantages to be derived—and to which claim is laid by the projectors—from this mode of adopting atmospheric power. It is true that the objections raised have been partially and successfully met by Professor Vignoles, and others; yet numerous doubts exist, up to the present moment, as to the practicability, not only in a scientific, but a commercial, point of view, of effecting the object. Of the points investigated by the commissioners, the following are prominently put forward, as the main questions for discussion, and to which Mr. Bergin directs his particular attention, accompanying his remarks by tabular statements:—

1. The expenditure of engine-power required to maintain any given amount of exhaustion already obtained in the working main.

2. The power absorbed or expended in producing any desired vacuum in the working main—involving, in this step of the inquiry, the discharging or exhausting power of the air pump, and the waste of power by reason of the leakage of the whole apparatus.

3. The separate determination of the part of the entire leakage, which, being due to the travelling piston, is constant for the same degree of exhaustion, whatever length of main be in use; and of the part which is variable being due to the long valve and joints, and consequently dependent on the length of main.

We do not propose carrying our notice of this brochure further, as it should be in the hands of all who take an interest in railway undertakings, the object of the writer being, as he himself expresses, "to prove that the labour of the commissioners, valuable as it has been, is not, in all respects, correct; and that, consequently, they have been led to conclusions, as to the economy and efficiency of this most interesting invention, considerably short of what may, with confidence, be looked for."

GAS METERS—ROYAL ADELAIDE GALLERY.

A series of lectures have been in the course of delivery at the Adelaide Gallery, by the proprietor, Mr. Jones, assisted by Dr. Atkin, on gas meters, and their fallacies, in the course of which it had been, from experiments, shown that the use of meters is considerably against the consumer, not only in consequence of the incorrectness of the instrument itself, but also from the want of knowledge on the part of the consumer to manage it. It was asserted that the addition of from one pint to a quart of water to a five-light meter, over and above the water-line, would tell against the consumer to an extent, varying, in different meters, of from 15 to 25 per cent. After much disagreement between the lecturer and the gas-meter manufacturers, who assembled in numbers on the several occasions, a challenge was given, and accepted, whereby the accuracy of the various kinds of meters at present in use might be tested, and Tuesday, the 24th inst., was appointed for that purpose. The lecture-room was, at ten o'clock in the morning, crowded with gas-meter manufacturers, all interests (of which there are so many in the gas-meter trade) being apparently united in the present instance, to prevent the grand *exposé* which was contemplated, although, at the same time, a good deal of confidence was exhibited. About four or five hours were occupied in testing the apparatus, and weighing into the gas-receiver ten cubic feet of water, at 62½ lbs. per cubic foot. Mr. Wright (a gentleman connected with one of the gas-meter makers), Mr. S. Exall (of Reading), and Mr. Sug, were appointed to see all fair. An objection was taken by Mr. Wright, that the mode of measurement was not correct, inasmuch as the falling of the standard gas-holder would raise the level of the water within the tank, and, consequently, discharge a greater quantity of gas than would be indicated by the pointer affixed to the gas-holder, and pointing to a scale on the side of the tank, equal in amount to that portion of the sides immersed in the tank. Mr. Jones argued that it was a matter of no importance, as the gas-holder was capable of holding thirteen or fourteen cubic feet of gas, and, consequently, the gas-holder sinking to the measurement of ten feet, must show that ten feet had passed through it, inasmuch as ten feet of water would then have been displaced. Dr. Atkin said that the objection, if tenable, would not affect the result of comparative trials of different gas-meters, as each experiment would be equally affected by the assumed defect in the gasometer, and that the counterpoise playing on a cycloid, exactly compensated the difference between the weight of water displaced, and that of the holder, whether the holder were much or little immersed in the water of the tank. It could only vary in pressure, as shown by the guage, and not in quantity, and as the measures on the upright agreed exactly with those on the holder, determined by the weight of the cubic feet of water introduced, the pointer adjusted to the former, must indicate the exact quantity of gas consumed. Much discussion taking place upon this point, it was agreed that Mr. Wright should make his objection in writing, and that Dr. Atkin should reply in writing, Mr. Jones undertaking to print both at his own expense, and send them round to the public. The apparatus being ready, a ten-light wet gas-meter, that had been for some time in use, and had been brought direct from the consumer's house to the Gallery, was submitted to the test of twenty feet of gas, or one revolution of the drum; the guage showed the pressure to be at the inlet 8 tenths, and at the outlet 5½-tenths, the ten burners consuming, upon the average, five cubic feet per hour each. The result was, after two trials (the first having been stated to be objectionable, on account of a slight escape), the meter was 3½ per cent. fast by the standard, or, allowing the objection raised by Mr. Wright to be correct, 1½ per cent. fast. Twenty burners were then lit, instead of ten, and another twenty feet of gas passed through the meter, the pressure at the inlet 6½-tenths, at the outlet 3-tenths, but the result was precisely the same, the meter being still according to the standard, 3½ per cent. fast. Mr. Jones then proposed that one pint of water should be added, to show the loss to the consumer, from the water being above the level line, but it was objected, on the part of the meter makers present, that if that experiment was entered into, there would be no time for a dry meter to be tested. The question was put to the vote, and, after much confusion and loud cries of "No, no!" "We will have the dry meter," &c., it was decided in favour of the dry meter; consequently, a ten-light one, of Mr. Defries' manufacture, was brought forward, and which had been in use between two and three years, and, certainly, considering the construction of the instrument, in no very favourable situation, it having been taken from a confectioner's, where it had been kept only a few feet from the oven. Mr. Defries objected to that one being tried, and contended that his improved dry meter (No. 2 patent) ought to be tested first, as it was equal to a chronometer for correctness; this, however, was overruled, and the gas was put on. The pressure at the inlet was 6½-tenths, and at the outlet 5½-tenths, which proves that the dry meter performs its work at less pressure than the wet meter. The result of the experiment was, according to the standard, 2½-tenths fast, or, allowing the objections of Mr. Wright, the meter was, after two or three years' use, *correct*. With twenty lights, the pressure at the inlet was 6-tenths, and at the outlet 2-tenths; the result was 3-tenths slow, or in favour of the consumer, as argued by Mr. Wright. According to these two experiments, the superiority must be awarded to the dry meter, which much astonished the wet meter makers present, who evidently were congratulating themselves on quite a different result. It appears to us that the construction of the dry gas-meter totally prevents the chance of any carelessness on the parts of servants, or others, making the meter tell against the consumer, as may happen in the case of the wet meter, by the addition of an excess of water; and there is one other great advantage of the dry meter—viz., that the frost will have no effect upon it whatever. Further experiments are to be made on Tuesday next, at ten o'clock in the morning, at which parties interested are invited to attend, no charge being made to those who are connected with the manufacture of gas meters, or with the various companies. At the close of the business, all parties present agreed that nothing could be more fair than the manner in which the experiments had been conducted by Mr. Jones and his assistants. The experiment upon which depends the correctness of Mr. Jones's former statements—viz., the introduction of an excess of water into the wet meter, was not entered into on this occasion, but it is to be the first trial on Tuesday next, an accurate statement of the results of which shall appear in our columns.

THE GREAT BLAST AT ROUND-DOWN CLIFF, NEAR DOVER.

This splendid operation, which has caused much sensation in the scientific world for some weeks past, was carried into effect on Thursday last, with the most perfect success, and reflects the highest credit on Mr. Cubitt, who suggested and matured the plan, for his careful calculations and engineering skill. An erroneous rumour had been in circulation, that the three great mines formed in the cliff were planned by, and executed under, the direction of Major General Pasley; that gentleman, however, with praiseworthy candour, has sent a letter to the *Times* newspaper, disclaiming any share in the credit of the undertaking, which was entirely designed, and carried into the most successful operation, by Mr. Cubitt. General Pasley was applied to by Mr. Cubitt, only for his valuable assistance in the arrangement of the voltaic battery, on which he (Mr. Cubitt) has had no experience, and General Pasley recommended an application to the Board of Ordnance to permit the valuable services of Lieut. Hutchinson, of the Royal Engineers, to be made available, which was cheerfully complied with. Two o'clock was the hour named for the explosion, and long before that hour, every height (within a respectful distance of the spot to be operated upon) was studded with spectators. A line of demarcation was made by signal flags, and police and artillery were stationed along it, to prevent the populace passing the boundary. The Round-down cliff overhung the sea to a considerable extent, and it was the original intention of the South Eastern Railway Company to form a tunnel through it, but tremendous falls having taken place, which rendered the stability of the cliff itself insecure, it was judiciously resolved to remove it by blasting. A mine, consisting of three cells, connected by galleries, was constructed, in which was placed 18,500 lbs. of gunpowder; the ignition of the charges were under the direction of Lieut. Hutchinson, and, on the signal given, the wires of the battery were connected—the earth suddenly trembled, as from the shock of an earthquake, for more than half a mile from the spot—a deep, convulsive, stifled report, was heard—the base of the cliff, for 500 feet in length, was projected with irresistible force seaward—and, in a few seconds, the projection of the cliff, consisting of not less than 1,000,000 tons, settled gently into the sea below. To give some idea of the gentle swimming motion of this mighty mass, it need only be mentioned, that the flag staff which had been placed on the point of the cliff retained its upright position among the *debris* carried into the sea. This is the largest quantity of powder ever used in one blast, not even excepting the great mine at Bhurtpore, in the East Indies, from which such splendid results were obtained. Altogether, it reflects the highest credit on the engineer, and, taking into account every expense, the company will save by the operation at least 1000*l.*

ENGLISH MACHINERY.—We understand that an amusing instance of French boasting occurred some time since in the Brazils. A French steamer (the *Gomer*) having arrived at Rio de Janeiro, her engines and fittings-up were immediately exhibited, with great pomp, by the captain and officers, and their superiority over those of the British steamer (the *Salamander*) loudly proclaimed. Some English gentlemen, however, being invited to inspect them, they found the name of the makers, "William Fawcett and Co., of Liverpool," stamped upon the so much vaunted specimen of French superior skill in machinery.

EXTRAORDINARY MECHANICAL INVENTION.—We learn from the papers, that Mr. Rew, residing at Milton, after eleven years' study, has succeeded in completing some machinery, which will, when brought into use, he imagines, supersede the aid of steam-power. It may, he thinks, be applied to clocks of any description, requires no winding up when put together, and will continue going so long as the materials last.

A LONG YARN.—Mr. Atkinson, rope manufacturer, of Preston, has received an order from the Admiralty to manufacture 75,000 fathoms, or 85 miles 400 yards, of line! for Captain Belcher, of the *Samarang*, going on an exploring expedition. The yarn is to be tough as well as long.